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Factors Determining Food Safety in Cuban Municipalities: Limitations and Capacities for Chain Approach Management

Abel Gamboa Costa[1], Enrique Loret de Mola López[2], Yordanis Escalona Fernández[3], Iris María González Torres[4] & Ramón González Fontes[5].

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ABSTRACT

The aim of this paper is to identify the most commonly recognized determining factors of food safety, according to the dimensions established at the municipal scale; and secondly, to assess the capacities and limitations for chain approach management, in Cuba. Various national and international related methods, laws, programs, and policies were examined. The documentary review resulted in the classification of 10 factors, including four dimensions: availability (4), access (3), stability (1), and food use (2). The most commonly recognized factors by 16 authors were, 1) income level, 2) food prices, 3) local food production, 4) basic sanitation. A 5th factor was included, according to the authors' criteria about the characteristics of the Cuban scenario: seasonality of crops and food items. They were linked to the agro-food chain through examples derived from the implementation of business projects and initiatives. It was concluded that the factors that determined access in terms of consumer market demand top priority in terms of municipal development strategies and Management of Municipal Administrations. Meanwhile, the limitations to apply this approach are mainly the contradictions between sector and local development.

KEY WORDS/: food safety, agro-food chains, public policies, municipal government.

INTRODUCTION

Since their implementation, social and economic policies of food safety have been dealt with by international bodies. According to de Castro (1964), among other topics, the former League of Nations in 1928 held permanent discussions on people nutrition. Today, the second goal of Sustainable Development of the United Nations Organization (UN) for the 2015-2030 period,

[1]Bachelor of Science in Geography, Assistant Professor. Center for Environmental Management Studies. Faculty of Applied Sciences Ignacio Agramonte Loynaz University of Camagüey: abel.gamboa@reduc.edu.cu
[2]Bachelor of Education, Geography major. PhD in Geography. Full Professor Department of Geography. Faculty of Applied Sciences Ignacio Agramonte Loynaz University of Camagüey: enrique.loret@reduc.edu.cu
[3]Agronomy Engineer, PhD in Agricultural Sciences. Associate Professor. Department of Agronomy. Faculty of Agricultural Sciences. Vladimir Ilich Lenin University of Las Tunas: yordanisef@ult.edu.cu
[4]Bachelor in Economics; PhD in Economic Sciences. Full Professor. Center for Business and Local Management Studies. Faculty of Economic and Entrepreneurial Sciences. Ignacio Agramonte Loynaz University of Camagüey: iris.torres@reduc.edu.cu.
[5]Bachelor in Economics; PhD in Economic Sciences. Full Professor Center for Business and Local Management Studies. Faculty of Economic and Entrepreneurial Sciences. Ignacio Agramonte Loynaz University of Camagüey: ramon.gonzalez@reduc.edu.cu

included in the Post-2015 Agenda is, defeating hunger through food safety and proper nutrition for all and the promotion of a model for sustainable agriculture (Red Argentina de Cooperación Internacional (n. d.).

However, in the 2014-2016 period, the number of undernourished people in the world reached over 795 million, of which 34.3 million were estimated in Latin America and the Caribbean. By 2015, food production in that region was above the minimum caloric requirements for their population, though poverty and inequality continued to exist, with a direct effect on food access. In addition, malnutrition and the existence of food excess and leftovers indicate inefficient use of resources (FAO, 2015).

The Cuban scenario has no record of undernourished people, but shows remarkable deficiencies in terms of availability of foods produced in the country, with high import dependency. This handicap increases due to the progressive devaluation of the land for agriculture (Arteaga Hernández, 2012; ONEI, 2015); which is taking place locally, in the municipalities, since the beginning of the Twenty-first Century. A 1998-2000 study made by the WFP-IPF (2001) in the eastern part of Cuba concluded that the food production of 43 of the 54 municipalities of the five eastern provinces was insufficient to meet the 2400 k/cal demand per inhabitant.

However, relevant research has been done in terms of food safety at the municipal scale to revert that situation. Pérez Castro (2010) made a follow up, monitoring, and evaluation study of food safety in a People's Council, in the municipality of San José de las Lajas, province of Mayabeque. Escalona Fernández (2013) suggested a strategy to manage food safety in the municipality of Majibacoa, province of Las Tunas. Torres Rivero (2013) suggested a strategy to make local policy decision-makers in terms of food and nutritional safety in communities and cooperatives, which was implemented in the municipalities of the province of Pinar del Río.

Other related studies encourage analysis of food and nutritional safety management by the local governments (Ramos Crespo & González Pérez, 2014), using a diagnostic methodology in the municipalities (García Rodríguez, García Vilaú & Odio Collazo, 2017). However, only García Rodríguez, García Vilaú & Odio Collazo (2017) considered the chain approach as an element for analysis.

Other international research which might be applied in the Cuban context, is evidenced in studies conducted by Porter, Dyball, Dumaresq, Deutsch & Matsuda (2013), in which the state of food safety, cultivated surface, and resources demanded by three cities located in industrial countries, were determined for food consumption. They studied the capabilities and limitations of municipalities to foster food safety in family homes (Lendechy Grajales, 2007). They also characterized the type of food insecurity in communities (Pat Fernández, 2010). Besides, they offered methods to measure food safety and sovereignty (Lemos Figueroa, 2011). Moreover, they recommended a professional training program in that area (Ardón, 2012). Food access studies were also made (Dirección General de Análisis y Prospectiva de la Secretaría de Desarrollo Social, 2012), to device food and nutritional safety indicators at the national level (Menchú &

Santizo, 2002), and offer elements to build a public policy in terms of nutrition for early infants in Colombia (Navarrete Canchón, 2016).

Research on determining factors of food safety can also be mentioned, in homes (Dehollian, 1995; Pérez & Cattaneo, 2007), community (INCAP & PAHO, n.d.), municipal (Morón, 2001; Lemos Figueroa, 2011), and national (Menchú & Santizo, 2002; FAO, 2004, 2015). Nevertheless, no reference of chain approach was made in these studies.

Moreover, Lemos Figueroa, 2011 and Ardón, (2012) suggested the need to improve food safety by integration of all agri food chains, efficiency, and public-private coordination. Guideline No. 160 of the Program of the Party and the Revolution for the 2016-2021 period, urges for the application of the chain approach as a priority of the Cuban State to produce food (Communist Party of Cuba, 2016). Meanwhile, the National Plan for economic and Social Development to 2030 claims for the need to foster productive chains in the country (Communist Party of Cuba, 2017).

In that sense, there is a need to identify and classify the determining factors of food safety by dimensions, and according to their relation to the elements of the agri food chain, as a contribution to decision-making by the Councils of Municipal Administrations in Cuba, particularly in the food program. Therefore, the aims of this paper are to identify the most commonly recognized determining factors of food safety according to the dimensions established at the municipal scale, and to assess the capabilities and limitations for chain approach management in Cuba.

MATERIALS AND METHODS

This investigation (Figure 1) is based on the documentary review of 16 papers. The recommendations made by FAO (2004) were modified for preliminary classification into 16 factors (figure 2) within the four dimensions; ten of which previously consulted by 25%, or more, of authors, were selected (Table 1). The criterion for identification of the most commonly recognized determining factors was a moderate level of concordance, which implied recognition by 50% or more of the authors consulted (Table 1), based on Kendall concordance coefficient (W), where 0 represents no concordance, 1 represents complete concordance, and 0.5 represents moderate concordance. Other criteria considered were, (1)[6] territorial scale, just including the influential factors at subnational level; (2)[7] association of some factors determining food safety in their relations within the agri food chains; and (3)[8] information management by the system of information of the government.

[6]Adjusted from the national level to the municipal one, according to Menchú & Santizo (2002)

[7]Several methodologies were included to establish the relationship with the elements of the agri food chains (van der Heyden & Camacho, 2004; FAO, 2012; Agrocadenas, 2014; Tejeda, Sánchez & Puig, n.d.).

[8]Modified according to Pérez Castro (2010).

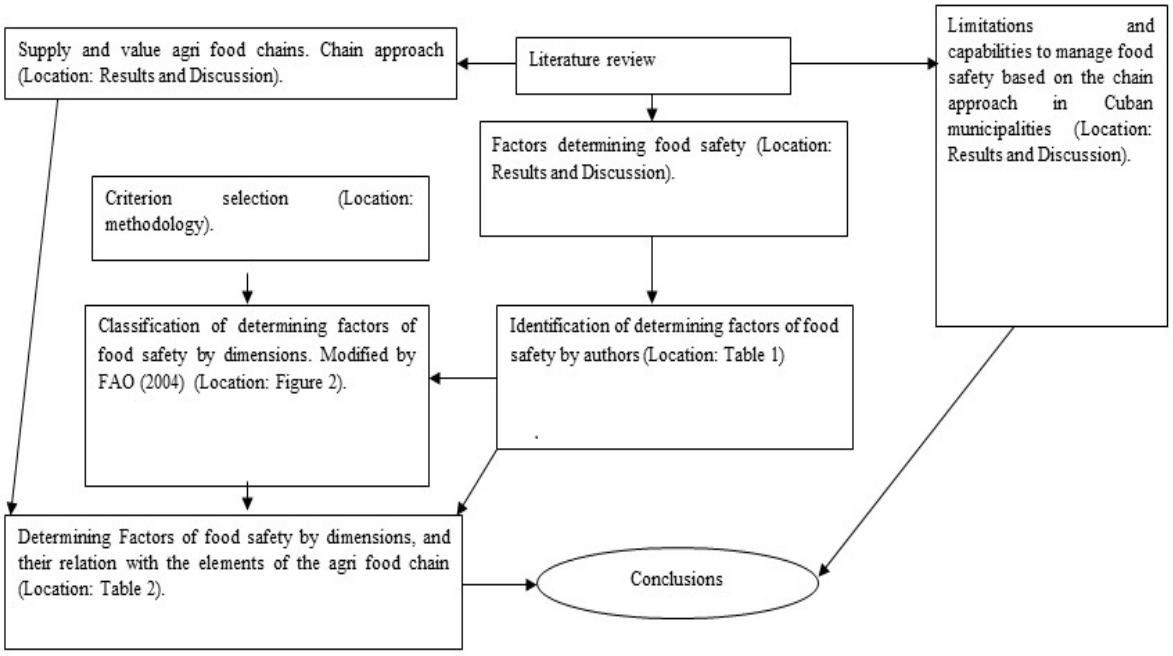

Fig. 1 Research scheme.

RESULTS AND DISCUSSION

The number of people who suffer undernourishment, malnutrition, or have access to leftovers, evidences the failure of food safety management both nationally and internationally (Rosset, 2004; Lendechy Grajales, 2007). In Cuba, undernourishment is not an issue to be addressed; the country meets the caloric requirements of the basic food basket. According to García Rabelo (2011), the Cuban experience is an example of the systematic effort to ensure the right to basic foods for all citizens, even in the harshest times, or at the expense of becoming indebted to foreign creditors. However, that author calls for urgent adoption of an approach that goes beyond agricultural policies, and can integrate all the components of the food system in the country.

Such integrated policy would require a systemic approach based on local productive systems, networks, local productive clusters, as well as global, regional, and local productive chains, and value and network chains. Davis & Golberg (1957) and Malassis (1979) were some of the pioneers of this approach in agrifood research.

Their coincidence may be analyzed through the criteria of Morales (2000), who claimed that Golberg & Davis (1957) recognized the identification of actors as a critical and fundamental aspect for companies operating in the chain to make their decisions. In turn, Malassis (1979) noted that the chain cannot work outside the broader context of the agrifood sector, or regardless of the history of the social and economic system it is part of.

The complexity of these relations is caused by the singularity of food production. In that context, it is important to explain certain features that distinguish the agri food chain from other types of chains, especially when the value approach is assumed. Some of the features stated by Aramyan, Ondersteijn, van Kooten, & Lansik (2006), based on the characteristics abridged by Van der Vorst (2000), and Van der Spiegel (2004) are,

- Perishability of goods and production seasonality.
- Variable process performance, in terms of quantity and quality as a result of biological variations, seasonality, climate-related factors, pests, and other biological hazards.
- Government standards on environmental issues, and in relation to consumers (CO_2 emissions, food safety problems).
- Physical characteristics of products, such as sensorial properties, taste, odor, appearance, color, size, and image.
- Product safety: better consumer service regarding the products and the production method; no hazards are allowed to food consumers.

According to Agrocadenas (2014), the value chain is a way of articulation, in which the actors plan, prepare, organize, coordinate, and collaborate, so the product is sold with the features required by the end consumers. In it, the direct and indirect actors set up alliances to maintain or increase the value of products during the process. Particularly, agri food chains create the need to implement the value chain approach, which means it can be used for agri food chain management.

The agri food chain is a system that comprises interrelated economic and social actors who take part in value adding activities to a product or a service, from production to the end users, including input suppliers and service providers, transformation, industry, transport, logistics, and other support services, like financing (García Winder *et al*, 2009: 2).

This research assumed the definition made by García Winder *et al.* (2009), and the concepts of other researchers (García Winder *et al*, 2009; Agrocadenas, 2014) of value creation, relations among actors, and market-oriented, as common elements. Nevertheless, the previous definitions do not include shared vision and common goals as a requisites used as premises, which can also bring benefits to direct and indirect actors. Iglesias (2002) claimed that the value chain is created when the actors have shared vision and common goals, and when they agree to pursue specific market objectives that help make joint decisions to meet consumer needs. In that sense, the Canadian Agri-Food Policy Institute (2012) stated that the agri food chain should possess a collaborative structure.

Although systemic and prospective, the logistic approach prevails in supply chains (Van der Vorst, 2000). Therefore, these chains place more emphasis on costs of production and the

creation of value for customers, than on the price of foods (Van der Vorst, 2000; Farias Pereira & Csillag, 2004; Aramyan, Ondersteijn, van Kooten, & Lansik, 2006; Bunte, 2006). On the contrary, price is a determining factor for the agri food chains based on the value approach (Pomareda Benel & Arias Segura, 2007).

Meanwhile, to set up the differences among the supply, production, and value chains, it is important to know the type of management, the chain structure, vision, mission and goals, the objectives of the actors, decision-making processes, market-oriented type, and the economic context (Iglesias, 2002; Canadian Agri-Food Policy Institute, 2012, Agrocadenas, 2014, Goch, n. d.). When the value approach is incorporated, a value chain continues to be the supply and production type, but it changes management.

According to Goch (n.d.), many attempts have been made to describe what distinguishes a supply chain from a value chain. However, the efforts to establish a clear-cut difference between the two, do not acknowledge that management is the key differentiator. Neither, they recognize that though management is a dynamic process, a supply chain cannot transform quickly into a value chain. They also state that many other agricultural and agri food companies have embraced the supply chain management approach, though the value chain approach has demonstrated its superiority.

The chain approach is a methodological representation of reality, but its actors are inserted in neighboring productive clusters, with certain levels of spatial concentration. Therefore, it must be based on the systemic approach, prospective vision, planning, and market. Equally important are the social and political approaches, as pillars of social relations among different actors (Antúnez Saiz & Ferrer Castañedo, 2016).

In that sense, further analysis should be made on proper use of municipal government capabilities to foster food safety (Lendechy Grajales, 2007; Pérez Castro, 2010; Escalona Fernández, 2013; García Rodríguez, García Vilaú & Odio Collazo, 2017), with the implementation of the above mentioned systemic approach in the production-transformation-change-consumption cycle. Accordingly, there are positive experiences, like in Bolivia, where the municipal government is considered as the key actor within public institutions, because it plans and implements local development policies and programs, and acts as coordinator with other government instances and the local actors (WFP, 2008).

Nevertheless, in Cuba there are initiatives that contribute to the introduction of the chain approach in food production. Tejeda, Sánchez & Puig (n.d.) offered a practical explanation of the chain approach by means of a diagnostic of the chain in horticultural seeds in the province of Ciego de Ávila. According to Arteaga Hernández *et al*. (2012), the Program for Local Support to Agricultural Modernization in Cuba began to support the Cuban government with actions to reduce the high dependency on imported foods, making emphasis on strengthening small cooperatives, and creating decentralized local spaces and capabilities in the Ministry of Agriculture to perform diagnostics of agri food chains. As a result, high priority was given to the availability dimension.

Likewise, the program to support agri food chain strengthening, Agrocadenas (2014), suggests a chain approach diagnostic to identify problems and opportunities. Internationally, the goal of FAO (2012) was to increase income and food safety of poor and small farmers in rural areas of Nicaragua, through the promotion of garden vegetable chains. Project development is a capability and an opportunity to implement the chain approach in food safety management.

Concerning proper use of the capabilities of the municipal government, Vázquez & González (2017) considered that the articulation of local actors involved in agricultural production is a need for the adoption of agroecology in Cuba. In an analysis of public policies, these authors referred to planning, control, and state financing, as part of the functions of municipal governments. These functions, however, require coordination, evaluation, and promotion of local development. In order to achieve that, the municipal government (Council of Municipal Administration) represented by the deputy presidents of food management, economy, and other officials, must count on the necessary work of the human capital as part of a multidisciplinary group made by government officials and executives of the organizations involved in decision-making. Some of the municipal capabilities to manage food safety based on the chain approach in Cuba are,

- A legal team working on the right of nutrition in the Constitution of the Republic (1992), Family code (1975), and the Work Code (2014). Additionally, there is a National Plan of Action for Nutrition (1994), a National Program in Collaboration with the WFP directed to vulnerable groups, the Program of the Cuban State to Face Climate Change in the Republic of Cuba, known as the Life Effort, by the Ministry of Science, Technology, and the Environment (2017).
- One of the missions of the municipal governments established in the Constitution of the Republic of Cuba is to contribute to production activities and plans of the organizations that are not within their subordination (Editora Política, 2010).
- There are some institutions, companies or representatives of organizations whose mission is to accomplish food safety at the municipal level, such as the municipal offices of Physical Planning from the Ministry of Economy and Planning (MEP); municipal offices of Finances and Prices; municipal offices of the Ministry of Agriculture; business entities from the Ministry of Domestic Trade (MINCIN); food-processing companies from the Ministry of Food Industry (MINAL); the Institute of Hygiene and Epidemiology from the Ministry of Public Health (MINSAP); and specialists from the Ministry of Science, Technology, and the Environment (CITMA), all under provincial subordination. Additionally, 89 guidelines of the social and economic policies of Cuba (Communist Party of Cuba, 2011) are directly or indirectly associated to food safety management.
- Implementation of the local development program by the municipal governments (Vázquez & González, 2017)
- Food production project in the municipalities with a value chain approach (Suárez Castellá, Hernández Pérez, Roche Hernández, Freire Seijo & Alonso Amaro, 2016; Acevedo Suárez, Gómez Acosta & López Joy, 2012; Program of Local Support to Agricultural Modernization in Cuba, 2015; Alonso Amaro & Campos Gómez, 2016; Elizondo Lopetegi, & Nazco Chaviano, 2017; Tejeda, Sánchez & Puig, (n. d.).

In that sense, food safety management in Cuba should be part of municipal development strategies based on a diagnostic that includes progress indicators for the different dimensions of

the process. It should also be run by the local governments, and based on group cooperation to make proper use of development potentials, in concert with the provincial and national priorities. The above requires methods that favor follow up, monitoring, and evaluation of food safety. Besides, that entity should lead and watch over policies and plans of food safety management with a territorial approach (Pérez Castro, 2010; Escalona Fernández, 2013; Ramos Crespo & González Pérez, 2014).

According to these authors, several barriers or limitations hamper coordination, cooperation, and collaboration as mechanisms, as well as management as a process run by municipal governments to introduce the chain approach in Cuban municipalities. It is a starting condition to increase the level of food safety in municipalities. It requires the existence of a collaborative structure in the agri food chain, in which the government can play a pivotal role in coordinating horizontal and vertical-horizontal relationships of their actors. The previous does not contradict, but complements the aspirations of the Communist Party of Cuba (2017) for the agroindustrial sector, which calls for agricultural state-owned companies to become the key managers of technological development, and production and marketing strategies.

However, according to Valdez Paz (2010), the fact that Cuban agriculture has been set up independently from municipal governments is a contradiction. Their entities respond to national business management bodies (OSDE), in contradiction to the expected update concerning decentralization of the Cuban economic and social model. The previous limits food safety management with the use of local resources, and affects the autonomy of food availability. In other words, it creates difficulties for the implementation of the local self-supply program. Therefore, the advantages of municipal governments as sub-national authorities are underestimated, which, according to Lendechy Grajales (2007), have first-hand knowledge of the reality and local problems, and a better understanding of the local environment. It gives them greater capability to design adequate policies and actions to meet the needs of the population, and have direct access of citizens to that entity.

Accordingly, González Fernández (2015), the Council of Municipal Administration should use its governmental and institutional capabilities to manage development policies, aptitudes for decision making of local actors, and an increase in productive networks, as factors of territorial planning; though Cuban municipalities pose barriers that hinder self-management in general terms, and in the introduction of the chain approach, particularly. According to Lendechy Grajales (2007), these obstacles, breaches, or limitations, are the set of factors that hamper the accomplishment of goals and objectives of municipal management, or their development plans, depending on the particular case. These limitations are expressed in insufficient theoretical-methodological and practical knowledge, which hinder food safety management in Cuban municipalities, even with the application of the chain approach:

- Significant absence of localized information (Albuquerque, 2004; Guzón Camporredondo, 2006).

- Absence of proper information for decision-making (Fernández Estrada & Fernández Pérez, 2017). Individual actions among key actors, which hinders the efficiency and efficacy of food safety, and lead to lack of communication and fluid dialog among all shareholders (Torres Rivero, 2013).
- Lack of a territorial approach in terms of food safety (Niemeyer & Scholz, 2008), which is taken to the autonomy level as an issue of added availability (Morón & Schejtman, 2010).
- The inexistence of a law, national program, or strategy of food safety in Cuba, which limits the implementation of territorial plans of food safety by the Councils of Municipal Administration. Therefore, these must be included and implemented as part of the strategies of municipal development.
- There is no explicit announcement of the need to fulfill the objective of food safety in the update of those guidelines for the 2016-2021 period (Communist Party of Cuba, 2016). That tendency is also observed in the establishment of the Cuban social and economic model of socialist development (Communist Party of Cuba, n. d.).
- Insufficient autonomy of local governments for territorial decision-making (Boffill Vega, 2010; Mulet Concepción, 2013, 2015; Fernández Estrada & Fernández Pérez, 2017).
- Insufficient municipal budgets that do not meet the local needs, though local development and foreign collaboration projects are foreseen in the economic plans (Mulet Concepción, 2015: 53).
- Insufficient development projects directed to local territories (Castro Morales, 2017).
- Priority of sectoral development that conditions the verticality of production and value chains in Cuba (Alonso Alemán, 2012; Mireles Torres, 2013; Agrocadenas, 2014). The production sector in the municipalities is mostly subordinated to the provincial and national instances (Herrera Díaz, 2013).
- Municipal government management is still focused on the indicators that contribute to national or sectoral development, whereas local problems pile up without foreseeable solution (Mulet Concepción, 2015).
- Insufficient horizontal relations among economic actors in the territory to organize agricultural production in a production chain (García Rabelo, 2011; Agrocadenas, 2014; Tejeda, Sánchez & Puig, n.d.).
- Absence of control and follow up of indicators to evaluate the nutritional needs of the population, in the Councils of Municipal Administration (Verdecia Tamayo, 2014).
- Practically inexisting food processing industry (including shipping) of agricultural products (as part of collection and commercialization); it works mainly for green vegetables, fruits, tubers, beans, and rice, which increases losses. Some of the difficulties of the processing industry are insufficient capacity, outdated technology, and lack of containers. Therefore, the systemic approach is extensive to preservation (warehouses, cold stores), of harvested crops and industry (Nova González, 2010: 42).

Agri food chain management in Cuba are affected by the municipal and national limitations combined. Some of the external limitations are commercial and financial sanctions, difficulties to obtain credits and hard currencies, and energy and input dependencies of agri food chains (Agrocadenas, 2014).

Hence, the Cuban municipalities should adopt the above-mentioned approach promptly, in order to make better use of the local capabilities, increase production, and cut down the losses in the agri food chain. However, that is not the only issue to be addressed in relation to food safety in Cuba. It also involves food production, with a national decreasing trend between 2008 and 2011; it led to a rise in imports and foreign dependency (Nova González, 2013), causing a negative influence on stability. As to access, García Álvarez & Anaya Cruz (2014) noted that the costs of food acquisition for a Cuban family averaged 62%-74% in 2005, and 59-74% in 2011 of their salary.

However, Herrera Sorzano, González Sousa, Gamboa Costa & Mármol Fundora (2011), on calculations of the basic food basket made by Nova González (2006), showed a red flag in terms of economic access, considering the mean monthly salary as the only source of income. This analysis denotes a remarkable difference between income and salary to meet the nutritional requirements of the Cuban population.

In 2008, the mean monthly salary of Cubans was enough to buy the recommended 2400 kcal (an ideal condition, supposing it is the only expense). The question would be if they could afford to buy food for another person, a child, for instance, and the response is negative. It was only possible in a few provinces in the middle and west of the country, whereas in the five eastern provinces, the deficit reached $37-59 CUP to buy the basic food basket for two people living on a mean monthly salary (Herrera Sorzano, González Sousa, Gamboa Costa & Mármol Fundora, 2011: 21).

The previous research was made for normal times. Nevertheless, due to the geographical location of Cuba and its situation, exposed to natural elements, like strong winds, heavy rainfall, recurring and extreme droughts, sanitary hazards (epiphytes and epizooties), aggravated by the speediness of climate change, it is important to consider exceptional situations that can change food prices for a considerable time. In the current scenario, the councils of municipal administrations must assume the criterion of Castillo and Vargas (2009), who stated that the organization may decide the way in which the scenario will be influenced, and even re-invent the way in which it is organized internally, though there are enforced limitations and rules for decision makers in the municipalities. The above leads to a series of questions:

Will increased food autonomy make the local self-supply program the basis of integrated food safety in all its dimensions, with low foreign dependency thanks to food autonomy?

The local self-supply program should depend on the capabilities of the municipalities, with respect to specialization and production vocation of the soils, in order to provide the population with the highest amounts of quality-nutrient, culturally accepted, worthy foods. Autonomy must

not be confused with autarchy, which, according to Ghersi (2010) is a trait from pre-agricultural stages in the agri food system.

How can food production be organized in the Cuban municipalities?

Giving top priority to efficiently-harvested national foods requires resources and investments under the principle of productive chains (Communist Party of Cuba, 2017). However, guideline No. 165 of the social and economic policies of Cuba, concerning agroindustry, subordinates the application of productive chains in production poles, as a way to organize production to supply foods to cities (Communist Party of Cuba, 2017).

The above is contradictory, since every value chain must be horizontal, mainly, with the ensued decentralization, increased autonomy, cooperation, and collaboration. Meanwhile, productive poles may work as enclaves at the risk of absorbing natural resources and labor force, and concentrating innovation, in case they do not become development poles and just behave as growth poles. It would be contrary to the local development of municipal self-supply. Besides, three questions may arise from it: 1) Do the local actors in the chain collaborate? 2) What percent of production is earmarked to the municipality? 3) Will the municipality respond to strong national vertical interests?

Regarding adaptation to climatic change, why are strategic food safety actions 3 and 4 of the Vida (Life) Assignment mainly centered on soil use changes, preservation, and introduction to drought-resistant crops, and stability in the availability dimension, but overlooks the effects of climatic variability and extreme events on food prices and, therefore, on the access dimension? However, Tobón Cruz (2014) noted that food prices are doubled after heavy crop losses.

To address the previous questions, it is indispensable to consider the factors determining food safety by dimensions and from a whole vision, as a management process. In that sense, some determinants may change the current situation positively. The most relevant, according to Escalona Fernández (2013), are the political will, the leadership of municipal governments and their interaction with the local institutions, synergistic relationships with national and international organizations, and the innovating sense of social actors that leads to multidimensional management with a process approach. All of it denotes the need to generate theoretical and methodological tools to make it possible.

Lendechy Grajales (2007) considered that management of food safety, administration and management of physical, natural, and financial resources, as well as food education by the government, are determining factors, the organization of producers and government to sell products and continued evaluation of official programs of food safety. Importantly, other authors consider institutionalism and public management as dimensions of food and nutritional safety (Menchú & Santizo, 2002; FAO, 2004; Ramos Crespo & González Pérez, 2014).

FAO (2004), in a strategy to improve food safety in Andean countries, said that increasing production and competitiveness of food chains is a strategic goal of availability. Lemus Figueroa (2011) assured that the capability of producers to organize in productive chains, may improve efficiency and cost-effectiveness, and therefore, produce income to purchase foods for household consumption, which has to do with the access dimension.

Previous studies show that the function of the elements in the agri food chain are influenced by the determining factors of food safety (Figure 2), but it is also manifested directly through the relation between the application of the chain approach and an increase in food safety with the benefits brought by the approach. These advantages are observed in the performance of agri food chains as key factors of food safety, since they promote greater production, a reduction of post-harvest losses, increased consumption of nutritionally adequate foods, and import substitutions (Uribe Galvis *et al*., 2011; Marco de Asistencia de Naciones Unidas para el Desarrollo, (n. d.); Pérez Rozzi, 2014).

Other advantages of the chain approach are explained by Agrocadenas (2014): 1) based on the market demands; 2) locally built, which ensures the integration of direct and indirect actors under the coordination of the municipal governments. In conclusion, the former is related to food habits and people's nutritional needs, and has to do with the access and food use dimensions; whereas the latter may be linked to public management and institutionalization, if the study is guided by a food and nutritional safety approach (FNS), or chain approach, as the case of this study.

One of the national priorities pursued by the United Nations Development Framework (n. d.) is to "guarantee food safety to all the population, focusing on population groups". Its aim is to increase the efficiency, sustainability, and adequate hygiene-sanitary conditions, of the food chain in the 2014-2018 period, with an intergenerational and gender approach to raise the consumption of foods with proper nutritional levels, and to substitute imports.

Other initiatives have developed in the Cuban municipalities for food safety management, based on the chain approach. The above is evidenced in studies conducted by Agrocadenas (2014), with diagnostic and analysis of factors and internal conditions of the chain, particularly, market analysis, which advocates for orientation of the chain toward their commercial intentions and capabilities. Tejeda, Sánchez & Puig (n.d.) said this analysis takes places during chain characterization. However, these Cuban methodologies lack effectiveness in terms of meeting the expectations of society, because the chain approach is not the end itself. In the van der Heyden & Camacho (2004) method, the trend to place the state, not the society, as a buyer, was manifested after studies of production and value chains.

In accordance with the characteristics of today's scenario and the method´s trends, new issues should be addressed: Is the application of chain approaches a means or an end? Where does the creation of value end? What is its purpose?

Figure 2. Factors determining food safety by dimensions. Based on FAO (2004) through previous consultation of authors in Table 1.

In that respect, Iglesias (2002: 23) said that the value chain is a tool to cope with increased market dynamics, but it should not be an end by itself. In short, the agri food chain with a value chain approach offers a better response to consumer markets, with its efficiency, efficacy, and demand orientation. However, the end should be related to fair prices, dignifying access to food, environmental sustainability, and satisfaction of the people's needs and preferences to lead active and healthy lives. The previous would imply the inclusion of social liability, which can be reflected in its transparent mission and action, not just a means to create the necessary value, be more competitive, or establish in the market.

In that context, FAO (2012) took steps to combine strategic approaches to develop a market-based chain to increase food safety among poor and small rural farmers. Although it has not been included for chain analysis as part of the method, Tejeda, Sánchez & Puig (n.d.) have agreed on food sustainability as the end of the process. Therefore, in Cuba, identification, classification, and information delivery to the Council of Municipal Administration of the factors that determine food safety constitute an insufficient condition, since the participation of local actors is required for chain approach management. In that sense, a consensus for decision-making is important, for technical or working teams, (Agrocadenas, 2014; Arteaga *et al*, 2012; Antúnez Saiz & Ferrer Castañedo, 2016; Tejeda, Sánchez, & Puig, (n.d.).

González Fontes (2015) suggested the need to overcome sectoral approaches of management systems, and to combine the vertical-sectoral approach with a horizontal-territorial one, through the introduction of local economic relations that complement the gaps that the sectoral trends in

terms of resources cannot fill properly. It constitutes a need for planning as a mechanism of the economy.

Accordingly, the chain approach requires a working culture that transcends sectoral organization, and depends on integration, participation, and team work (Mireles Torres, 2013). The Cuban municipalities would benefit from the application of that type of collective work established by the Council of Municipal Administration. It might be arranged by specifying the local actors responsible for taking actions. Also, a work system should be set up, which includes monitoring of every indicator within the framework of a local commission that uses the information available in the government information system and the information generated by the working teams, as a coordination mechanism that makes a more effective decision-making management process of the factors determining food safety, seeking improvements.

Summarizing, the factors that determine food safety are caused by 1) the social and economic context of every Cuban municipality; 2) the limitations and capabilities for management; 3) and the advantages of applying the chain approach in those spaces. Therefore, the identification of such factors considered the three items above, which included national (Menchú & Santizo, 2002; FAO, 2004, 2015, Uribe Galvis *et al*, 2011), and family studies (Pérez & Cattaneo, 2007), adjusted to the analysis of this research, in the municipalities (Table 1).

The results of the literature review of factors that determine food safety by dimensions (table 1), showed a significant dispersion. However, the key indicators may be found in the coincidences for higher priority of food safety management. The most commonly recognized food safety factors are income level, food prices, local food production, and basic sanitation. Also included by the authors are, seasonality of crops and manufactured foods, due to the early development of the agri food chain in terms of production, transformation, and commercialization, with special emphasis on storing conditions and preservation in the municipalities. Furthermore, the horizontal relations among actors in Cuba are weak (Alonso Alemán, 2012; Mireles Torres, 2013; Nova González, 2013; Torres Rivero, 2013; Agrocadenas, 2014).

The identification of these factors evidenced the relevance granted to the access dimension by researchers (table 1). It coincided with the criteria of other authors (Pérez & Cattaneo, 2007; Ardón, 2012; Timmer, 2017). According to Ardón (2012: 70) the limited access to foods had the highest effect on food safety. Nevertheless, authors like Acevedo Suárez, Gómez Acosta & López Joy (2012), from a logistic approach perspective, claimed that production is the main factor that affects the consumer demands.

Table 1. Literature review of factors determining food safety by dimensions.

Authors	Factors by dimensions[9]										Number of factors by author[10]
	D1	D2	D3	D4	A1	A2	A3	E1	UA1	UA2	
Dehollain (1995)					x	x					2
Riely, Mock, Cogill, Bailey & Kenefick (1999)	x				x	x			x		4
Morón (2001)	x								x	x	3
Menchú & Santizo (2002)	x	x	x		x	x					5
FAO (2004)	x		x		x		x		x	x	6
Pérez & Cattaneo (2007)	x	x							x		3
Pérez Castro (2010)						x	x	x	x		4
García Rabelo (2011)					x	x					2
Lemos Figueroa (2011)	x			x	x	x		x	x	x	7
Uribe Galvis *et al.* (2011)		x		x						x	3
Ardón (2012)	x	x			x						2
Ramos Crespo & González Pérez (2014)	x		x								2
Tobón Cruz (2014)				x	x						2
FAO (2015)				x	x	x	x	x	x		6
Timmer (2017)						x	x				2
INCAP & OPS (s/f)	x	x	x		x					x	5
Factor frequency	**8**	5	4	4	**10**	**8**	4	3	**8**	5	
W[11]	**0.5**				**0.6**	**0.5**			**0.5**		

The above might contribute to the design of local development strategies and the creation of indexes and indicators oriented to decision-making by the Council of Municipal Administration, with the purpose of increasing food safety. However, the importance of the Local Food Safety Index (LFSI) devised by Pérez Castro (2010) for the Cuban context is acknowledged[12].

Furthermore, the most commonly recognized factors that determine food safety in the literature, are presented along with the elements of the agri food chain through practical experiences from business initiatives and projects (table 2), though in the Cuban scenario it refers to internationally funded projects only. The above implies the need to increase the utilization of financial sources, like local development projects, and local contributions, which are capacities available in that

[9] (D1) Local food production; (D2) Internal sales; (D3) Post-harvest management; (D4) Climatic change and natural, sanitary, and technological hazards; (A1) Income level; (A2) Food prices; (A3) Price average and volatility; (E1) Crop and food product seasonality; (UA1) Basic sanitation; (UA2) Food and nutritional education.

[10] The number of determining factors by author in the table included the 16 authors referred to in this research (figure 1), which does not mean they were the only factors presented by the authors consulted.

[11] Kendall concordance coefficient (W).

[12] LFSI comprises the four dimensions through the formula below to measure food safety as a whole.

$$LFSI = \frac{(AI) + (AcI) + (SI) + (BUI)}{4}$$

Where, AI: Availability index, AcI: Access index, SI: Stability index,
BUI: Biological Use Index.
The quantitative interpretation is set between 0-1. Pérez Castro (2010) made a classification using a 3-point scale: (1) Low, (2) Mid, and (3) High.

space besides publication and visualization of the results. Regarding basic sanitation (Table 2), it is not directly associated to the elements of the agri food chain, because it is particularly determined by the surroundings.

Table 2. Most commonly recognized factors that determine food safety by dimensions, and their relation with the elements of the agri food chain

Factors determining food safety	Elements of the agri food chain	Factors determining food safety	Examples of related research
Availability	(1) Production	-Local food production	Suárez Castellá, Hernández Pérez, Roche Hernández, Freire Seijo, Alonso Amaro & Campos Gómez (2016) implemented a management system to reduce post-harvest losses, and increase food availability in six Cuban municipalities. The Agrocadenas project persuaded 1654 local and national actors of the relevance and pertinence of the chain approach for food production (Elizondo Lopetegi & Nazco Chaviano (2017).
Access	(4) Consumer market (Population)	-Income level	FAO (2012) identified the principles and opportunities to raise income and maintenance of small green vegetables producers in Nicaragua. Iliodort Romain (2014) determined the viability of articulating the production of rabbits by means of a value chain, on an integrated farm to increase the income of rural families.
	(4) Consumer market (Population and industry)	-Food prices	-
Stability	(1) Production; (2) Industrial processing of foods; (3) Commercialization	-Crop and food product seasonality	Corporation Colombia International implemented an information system of prices and outlets, which may lead to production programming

	and distribution.	practices (Instituto Interamericano de Cooperación para la Agricultura, 1999).
Food use	-Basic sanitation	-

CONCLUSIONS

The factors determining food safety for chain approach management in Cuban municipalities are influenced by the local capabilities and limitations. These municipal capabilities are enacted in the Constitution of the Republic of Cuba as formal attributions. They provide a legal and institutional framework with opportunities to benefit from internationally financed projects, local development programs, and local contributions, as potential sources of actions for local development.

However, these capabilities are still limited by obstacles in the municipalities, particularly, food safety management based on the chain approach. Some of them face municipal legal and normative framework that lacks food safety plans; with limited decision-making autonomy of municipal governments; poor development of agri food chains; as well as insufficient relations among local actors; insufficient contribution from local sources earmarked for local development projects; and so forth.

Overall, the contradictions between sectoral and local development are the main limitations. Before that scenario, agri food chains must make use of the value chain approach and not only meet the demands of consumer markets, but also focus on the needs of the population (society), which will call for a social liability of their strategies, which will be aligned with the indicators of the local development strategies.

Hence, the Cuban municipalities that have designed their local development strategies and use them as a managing tool, might include the most commonly recognized determining factors of food safety in the literature consulted; namely, local food production (availability dimension), income level and food prices (access dimension), and basic sanitation (food use dimension). Besides, the organizational and technological characteristics of Cuban agri food chains, recommend the inclusion of crop seasonality and food products in the stability dimension.

All these five factors, particularly, income level and food prices associated to consumer market, may comprise the indicators in the municipal development strategies and priorities of the councils of municipal administration for decision-making in food safety management. However, achieving food safety as a goal of sustainable development through the chain approach requires consideration of all the other factors that make up integrated management.

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